

Oil and Gas Commission

October 6, 1998

File: 2400-4805-59240-09
980749

Mr. Dick VanAppelen, P. Eng.
Exploitation Engineer
Canadian Natural Resources Limited
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Calgary, AB T2P 3L8

CNRL Pilot Project (16)

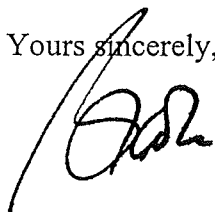
Dear Mr. VanAppelen:

**RE: APPLICATION FOR PILOT PRESSURE MAINTENANCE APPROVAL
BUICK CREEK LOWER HALFWAY "D" POOL**

This refers to your application dated August 21, 1998 wherein you requested approval of a pilot waterflood pressure maintenance scheme in the subject oil pool.

Attached is Approval # 98-09-005 for the application, granted under section 100 of the Petroleum and Natural Gas Act.

Yours sincerely,



B. van Oort, P. Eng.
Director
Subsurface Administration Branch
Oil and Gas Commission

Attachment

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APPROVAL 98-09-005

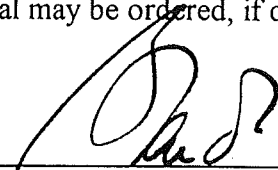
THE PROVINCE OF BRITISH COLUMBIA
PETROLEUM AND NATURAL GAS ACT
OIL AND GAS COMMISSION

IN THE MATTER of a pilot pressure maintenance scheme of Canadian Natural Resources Limited (CNRL) for waterflood recovery of oil by water injection into the Buick Creek Lower Halfway "D" Pool.

The Commission, pursuant to section 100 of the Petroleum and Natural Gas Act, R.S.B.C. 1996, c.361 orders as follows:

The pilot pressure maintenance scheme of CNRL for waterflood recovery of oil from the Buick Creek Lower Halfway "D" Pool as such scheme is described in the Application from CNRL to the Oil and Gas Commission (Commission) dated August 21, 1998, is approved, subject to the terms herein contained.

1. The pilot pressure maintenance scheme area shall be delineated by units 3, 4, 13 – 15 and 23. – 25 of Block ~~Ø~~_A/94-A-14.
2. The daily oil allowable is waived.
3. Water may be injected into the Buick Creek Lower Halfway "D" Pool through the well CNRES ET AL HZ BUICK b-14-A/94-A-14 (bottom hole location c-3-A/94-A-14).
4. The scheme shall be deemed to have commenced upon water being injected into the well referred to in clause 3, with the Commission being notified in writing of the date of commencement.
5. The injection pressure at the sandface must not exceed the formation fracture pressure.
6. Progress reports shall be filed as stipulated in Part 9, section 108 of the British Columbia *Drilling and Production Regulation*.
7. The operations of the pilot pressure maintenance scheme will be subject to periodic review, and modification to the approval may be ordered, if deemed appropriate.



Bou van Oort, P.Eng.

Director

Subsurface Administration Branch

Oil and Gas Commission

DATED AT the City of Victoria, in the Province of British Columbia, this 6th day of October, 1998.

OIL AND GAS COMMISSION

- I. Prepared for Bou van Oort, Director for **DECISION**
- II. **Subject:** "Pressure Maintenance" application under section 100 of the Petroleum and Natural Gas Act (P&NG Act).
- III. **Recommendation:**

Approval of a pilot waterflood pressure maintenance scheme in the Buick Creek Lower Halfway "B" oil pool is technically justified. There are no equity, resource conservation or environmental concerns. Your review and approval of this straightforward application is recommended under section 100 of the P&NG Act.

IV. **Background:**

Canadian Natural Resources Limited (CNRL), as operator, requests permission to inject water into an oil bearing formation. Waterflooding is an effective production stimulation technique for pools with good homogeneous reservoir. However, the Lower Halfway "D" pool has a high degree of reservoir heterogeneity. In order to determine water injectivity, CNRL requests a pilot waterflood approval.

The Buick Creek Lower Halfway "D" pool, located about 70 km north of Fort St. John, was discovered in 1991. To date the pool has been produced from six surface locations with two vertical and five horizontal legs. Cumulative production from the pool to the end of July 1998 is 1.25 MMSTB oil and 5.1 BCF gas with average GOR of 4100 SCF/STB. CNRL's estimated STOPIP in the "D" pool is about 20 MMSTB with total gas cap and solution OGIP of 24.9 BCF.

A limited pilot pressure maintenance scheme is proposed by CNRL to test the effectiveness of waterflooding this complex reservoir. Oil recovery under primary depletion is expected to be about 11% which could increase significantly if this pilot proves successful and the pressure maintenance scheme is expanded to the entire pool. (It is worth noting that in a similar pool namely Buick Creek Lower Halfway "B" pool, a secondary recovery scheme of gas re-injection was implemented in 1986 to maintain reservoir pressure and oil productivity. However, the gas re-injection was suspended in 1989 due to early gas breakthrough).

CNRL has 100% working interest in the requested portion of the pool. Objections were not received from any interested parties following publication of a notice of the application in the B.C. Gazette.

V. Discussion:

Approvals for industry applications granted under section 100 of the P&NG Act require signature of the Commission. The pilot pressure maintenance scheme under section 100 of the P&NG Act is justified for the Buick Creek Lower Halfway "D" pool and your approval of the scheme is recommended.

VI. Options:

1. Approval of the pilot waterflood pressure maintenance may improve recovery, resulting in higher oil production and higher Crown royalty.
2. Rejection of the application results in all wells remaining shut-in.

VII. Recommended Option:

Option 1.

Prepared by:

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October 6, 1998